CURRENT NOTES ON PHYSIOGRAPHY.

THE CASCADE MOUNTAINS.

THE Cascade mountains are genetically described by I. C. Russell (A Preliminary Paper on the Geology of the Cascade Mountains in Northern Washington, 20th Ann. Rep. U. S. Geol. Surv., 1900, pt. II., 83–210; 10 pl., 3 maps) with such success as to give much support to rational or explanatory methods in place of the absolute or empirical methods that have long prevailed. Instead of being a sharp crested uplift, the mountains constitute a plateau, believed to have been produced by the elevation of a peneplain, but now maturely dissected. The area described, from 100 to 150 miles wide east and west, and of greater but unknown length north and south, seems to have been once a nearly flat-topped dome, 7,500 to 8,000 feet in altitude, composed of greatly disordered rock masses, whose tilted strata had been broadly truncated by long-continued erosion when the whole region stood lower. The uplift of the dome is given a late Tertiary date, because the sediments and lavas of the Columbia basin are tilted up along the eastern slopes of the elongated dome; here landslides, to be counted not by hundreds but by thousands, have occurred along the escarpments formed by the resistant lava sheets overlying weaker sediments. The granite mountains about Lake Chelan and the dissected volcano known as Glacier peak overtop their surroundings; the former are thought to owe their height not so much to resistant structure as to local uplift in excess of their neighbors. (An alternative explanation is offered, but discarded, to the effect that the ancient peneplain lay at the level of the granite summits 2,000 or 3,000 feet above the present skyline.) It is explicitly stated that no remnants of the uplifted peneplain are to be seen to-day in the form of even uplands at mountain-top height; dissection has everywhere advanced so far as to leave only sharp ridges between deep valleys. The work of the glacial period is indicated in countless cirques or corries, whose floors were so far widened that the spurs between them became sharply serrate; by numerous trough-like main valleys, with hanging lateral valleys; by lakes and moraines. The depth to which certain valleys, like that of Lake Chelan, have been eroded is taken to prove that the region stood about 1,000 feet higher than now in preglacial time; the capacity of glaciers to over-deepen their valleys not being accepted.

THE GLACIER OF MT. ARAPAHOE.

W. T. LEE describes 'The Glacier of Mt. Arapahoe, Colorado' (*Journ. Geol.*, VIII., 1900, 647–654, 2 pl.) as occupying a cirque opening to the north beneath a summit whose altitude is 13,520 feet. The front of the ice shows a stratified structure, and crevasses are believed to break its surface, while a moraine follows its front, and a stream, whitish with rock flour, issues from its base. The valley into which the cirque opens has a broad floor and precipitous sides; it holds several small lakes, sometimes in rock basins, sometimes behind barriers of waste. Evidently the existing glacier is a small affair compared with the ice stream that once stretched down the valley towards Boulder creek.

RHINE, DANUBE AND NECKAR.

THE depredations committed by the Rhine and its large branch, the Neckar, on the headwaters of the Danube, already somewhat studied by others, are clearly set forth by Penck

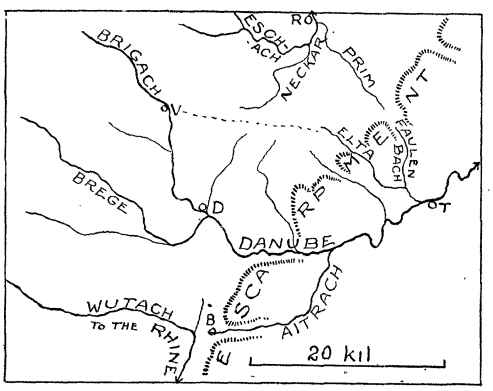

FIG. 1. Headwaters of the Danube between those of the Rhine and the Neckar. *B*, Blumberg; *D*, Donaueschingen; *R*, Rottweil; *T*, Tuttlingen; *V*, Villingen.

(Thalgeschichte der obersten Donau. *Verein f. Geschichte des Bodensees u. s. Umgebung*, 1900?). He shows that several ancient consequent streams flowing down the eastern slopes of the Black forest entered the Miocene sea of the

Bavarian foreland; and that as the sea withdrew the Danube was developed along its trough, engrafting into its trunk the many smaller streams that before had independent courses. As the valleys of the consequent streams were deepened, trenches were cut through the resistant strata of the white Jura, whose retreating margin was in time worn back (southeast) to form a cuesta with an infacing escarpment, while an inner lowland was opened on the weak Lias beds between the escarpment and the crystallines of the Black forest. To-day only one of the consequents (Brege-Danube) retains its course through the cuesta. The Wutach has been diverted from the Aitrach to the Rhine; the Brigach has been captured from the Elta by the Danube itself; and the Neckar has taken the Eschach from the Faulenbach. Similar changes are known for a long distance northeast of the Eschach, where the phenomena associated with the drainage of cuestas are illustrated in great variety. Penck uses the terms *Folgefluss*, *Schichtfluss* and *Gegenfluss* for consequent, subsequent and obsequent streams.

W. M. DAVIS.

CURRENT NOTES ON METEOROLOGY.

A NOTABLE STUDY OF ECLIPSE METEOROLOGY.

IN his paper on 'The Eclipse Cyclone and the Diurnal Cyclone' (*Proc. Amer. Acad. Arts and Sci.*, XXXVI., Jan., 1901, 307–318) Clayton has gone far ahead of all previous investigators of the phenomena of eclipse meteorology. Hitherto, as a general rule, we have had little more than a few scattered observations of temperature, pressure, wind direction, etc., taken during an eclipse, and tabulated, with a brief summary of the results. In his study of the meteorological data obtained in connection with the total solar eclipse of May 28th last, Clayton has derived results of far-reaching importance, which throw light on two of the largest problems in meteorology.

The meteorological changes due to the eclipse were first separated from other changes, such as the diurnal and the cyclonic, and were then plotted on maps of the United States for 8.15 and for 9 A. M., May 28th, 75th meridian time. These maps show that the winds were practically reversed in direction as the umbra moved from one side of the continent to the other, both maps showing a distinct anticyclonic circulation and an outflow of air extending from the umbra to a distance of about 1,500 or 2,000 miles. The temperature depression due to the eclipse appears on the 9 A.M. chart as an oval area. At the central portion of this area the depression exceeds 8° Fahr., and this area of greatest cold lags behind the umbra about 500 miles. A third chart was constructed by plotting the stations at their proper distances from the path of the umbra, and plotting the successive 15-minute observations at intervals of about 500 miles, the result being a synoptic chart showing the conditions observed at any station or group of stations when they were in different portions of the eclipse area. This synoptic chart indicates distinctly an anticyclonic circulation of the wind around the center of the eclipse, extending out to a distance of about 1,500 miles from the umbra. Beyond this there are indications of another ring of outflowing winds. The isotherms show an elliptical area of cold air (inner isotherm 6° Fahr.) central about 500 miles in the rear of the umbra. There was a rise of absolute and of relative humidity during the eclipse, the shape and position of the areas showing the humidity departures being very similar to those of the temperature. The pressure changes in this eclipse, and in other eclipses, show that in normal eclipses there is a central area of relatively high pressure; surrounding this a ring of minimum pressure, and beyond this, outside the edge of the penumbra, is a ring of maximum pressure.

The low temperature, the circulation of winds and the form of the pressure curve, all proclaim the development by the eclipse of a *cold air cyclone*, as described by Ferrel. Mr. Clayton points out that the eclipse may be compared with an experiment by Nature in which all the causes that complicate the origin of the ordinary cyclone are eliminated, except that of a direct and rapid change of temperature. The result shows that a fall of temperature is capable of developing a cold-air cyclone in an astonishingly short time, with all the peculiar circulation of winds and distribution of pressure which constitute such a cyclone. The fall of temperature acts primarily to cause a cyclone, and